

Using the KLWS chart: Have students use this graphic organizer to indicate what they **K**now about the episode topic, what they **W**ant to know about the episode topic, what they **L**earned about the episode topic, and what they **S**till have questions about.

As optional extensions, consider including **I**mportance (why is this information important?), **A**ctions (what actions will I take?), and **R**esources (what resources do I need and how will I find them?).

Steps:

- 1. Pre-viewing:** Share with students that they will be watching the next episode of The Career Center. Let them know that they will be using a KLWS chart to organize relevant information they gather from the episode and class discussions. Review how to use this organizer as needed. Have students complete the sections of the graphic organizer related to what they **KNOW**, and what they **WANT TO KNOW** about the topic of high tech manufacturing. Invite students to turn and talk with a shoulder partner to share what they have recorded. After students have had time to discuss, have volunteers share items from their **KNOW** and **WANT TO KNOW** lists, and create a whole class artifact capturing these comments.
Note: it's possible that students will have some misconceptions about the topic at this time. Accept all answers, and provide time for students to revisit these ideas after viewing the episode.
- 2. During viewing:** Have students add what they are **LEARNING** about high tech manufacturing. Students may also find they **STILL HAVE QUESTIONS** during viewing, so encourage them to add those to their organizer.
- 3. Post-viewing:** Have students add any additional notes in the **LEARNED** and **STILL HAVE QUESTIONS** sections of their organizers. Invite students to discuss what they've recorded in pairs or small groups before sharing in a whole group discussion. Encourage students to revise any previously held misconceptions.
Note: for any lingering questions, consider having students research answers on their own and bring back their findings to the whole group.



KNOW

WANT TO KNOW

LEARNED

STILL HAVE QUESTIONS

Overview

High tech manufacturing professionals work in a variety of fields. The common thread is that high tech manufacturing professionals must know and understand computers and the machines they control.

Example Careers

- CNC programmers
- Additive manufacturers
- Mechanical engineers
- Product engineers
- Software engineers
- Computer engineers
- Industrial machinery mechanics
- Aerospace product and parts manufacturing

Useful Skills and Abilities

- Communication
- Collaboration
- Critical Thinking
- Creativity
- Complex Problem Solving
- Productivity
- Operations Analysis
- Systems Analysis

Common Responsibilities for Careers in High Tech Manufacturing

- Create models of engineering designs or methods
- Test performance of electrical, electronic, mechanical, or integrated systems or equipment
- Confer with technical personnel to prepare designs or operational plans
- Implement design or process improvements
- Study blueprints or other instructions to determine equipment setup requirements
- Communicate technical information to suppliers, contractors, or regulatory agencies

Career Pathways and Salaries

Career opportunities within high tech manufacturing will vary based on education, experience, and training. CNC programmers need a high school diploma at a minimum, with some employers requiring an associate's degree or higher. People starting in mechanical engineering, for example, typically have a bachelor's degree.

Salaries in high tech manufacturing will vary based on education level and experience:

- CNC tool programmer = \$38,000 - \$87,000 annually
- Mechanical engineer = \$60,000 - \$136,000 annually
- Aerospace engineer = \$77,000 - \$168,000 annually
- Industrial Machinery Mechanics = \$37,000 - \$79,000 annually

Videos & Digital Resources

- [CNC Machinist](#)
- [Careers in manufacturing](#)
- [Additive Manufacturing](#)
- [Mechanical Engineering](#)
- [Software Engineering](#)

Extension Activities

- [Brainstorming Activity](#) (10 - 15 min)
- [Research](#) (60 - 90 min)
- [Community Connection](#) (45 - 60 min)

Michigan and National Organizations

- [SME](#)
- [The American Society of Mechanical Engineers](#)
- [Society of Women Engineers](#)
- [National Society of Black Engineers Detroit Professionals](#)
- [Association of Equipment Manufacturers](#)
- [National Association of Manufacturers](#)
- [Aerospace and Electronic Systems Society](#)

Degree & Certificate Programs*

- [Muskegon Community College](#) (CNC Programming/Machining)
- [Oakland Community College](#)(CNC Operator)
- [Michigan Tech](#)(Mechanical Engineering)
- [University of Michigan](#) (Aerospace Engineering)
- [Michigan State University](#) (Computer Engineering)
- [Ferris State University](#) (Product Engineering)

NOTE: this is not an exhaustive list, but rather a starting point for interested individuals.

Brainstorming

Purpose: To have students begin thinking about the various careers associated with the field of high tech manufacturing.

Overview: Students will work in pairs/trios to brainstorm as many careers as they can that are associated with high tech manufacturing.

Materials:

- [Brainstorming Graphic Organizer](#).
- Chart paper for class list of careers.

Procedure:

1. Have students work in pairs/trios for the first part of this activity.
2. Emphasize that there are many career options to choose from within the field of high tech manufacturing. Invite groups to work collaboratively to think of as many high tech manufacturing-related careers as they can. Have them add these to their Brainstorming Graphic Organizer. Students shouldn't feel limited by the number of circles on their organizer; if they need to add more branches to their web, they can!
3. After about 5 - 7 minutes, bring the class together for a whole group discussion. Invite each group to share one of the careers from their graphic organizer. Begin generating a class list on chart paper or on the board as groups share out. After each group has shared a career, invite each group to share another career that hasn't been mentioned yet. Do this until there are no new careers to add to the list.
4. Save the class list of careers for the [Research Activity](#).

Adapted from RealityWorks RealCare Program for Career Exploration

Research Activity

Purpose: To have students learn more about careers in high tech manufacturing through research.

Overview: Students will work in pairs to research two careers in high tech manufacturing and present their findings to the whole class in a brief presentation.

Materials:

- Class-generated list of high tech manufacturing careers.
- Library and internet resources.
- [Career Exploration Graphic Organizer](#).

Procedure:

1. Have students work in pairs for this activity.
2. Using the class-generated list of high tech manufacturing careers from the brainstorming session, have pairs select two of the high tech manufacturing careers to research further. It's alright if more than one group shares a career, but make sure each career is represented at least once.
3. Using the [Career Exploration Graphic Organizer](#), have pairs research their career choices. Helpful online resources include:
 - a. [U.S. Bureau of Labor Statistics](#)
 - b. [U.S. Bureau of Labor Statistics Occupational Outlook Handbook](#)
 - c. [CareerOneStop](#)
 - d. [O*NET OnLine](#)
4. Have pairs complete their research in class or for homework before having them prepare and present a short, 5 - 7 minute presentation. Their presentations should include, but not be limited to, the information from their graphic organizer.

Adapted from RealityWorks RealCare Program for Career Exploration

Community Connection

Purpose: To hear first-hand from professionals who work in high tech manufacturing in various capacities.

Overview: Arrange a panel discussion or short-term interactions with local business and community leaders in high tech manufacturing.

Materials:

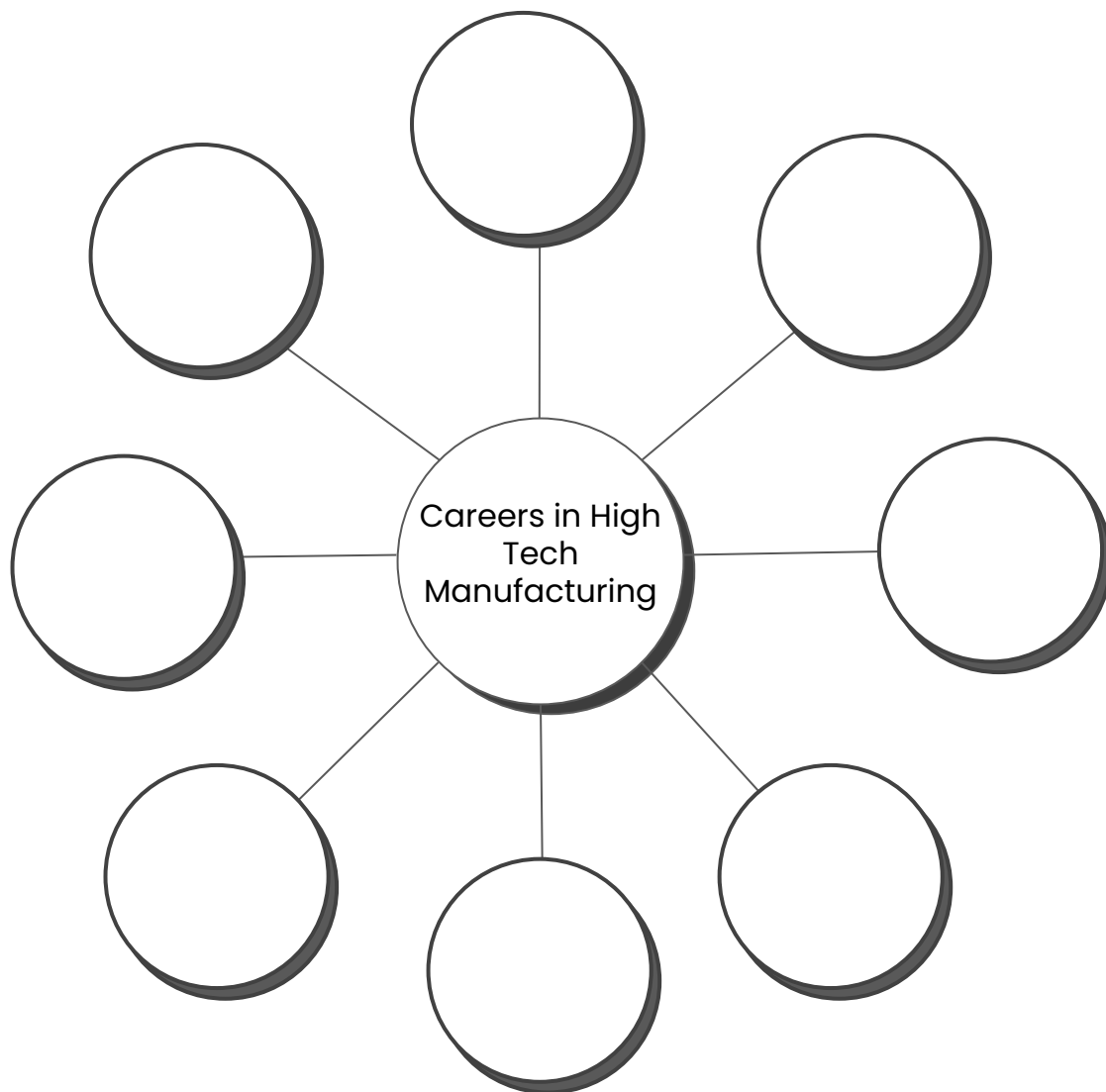
- 3 - 5 local professionals who work in a variety of high tech manufacturing careers.
- Student-derived questions.

Procedure:

1. Reach out to local professionals from various aspects of high tech manufacturing (e.g., manufacturing engineer, 3D printing engineer, machinist, maintenance technicians, etc.), inviting them to attend a Q & A discussion in your class (in person or virtually).
2. Prior to the discussion, have students compile a list of relevant questions to ask the panel of guests. You can find some [sample questions here](#) to help students get started in generating a list.
3. On the day of the guest speaker event, invite students to ask questions of the panel members.
4. After the guest speaker event, provide space for students to reflect and debrief. Sample student [reflection questions can be found here](#).

Adapted from RealityWorks RealCare Program for Career Exploration

Brainstorming Graphic Organizer



Career Exploration Graphic Organizer

	Career 1	Career 2
Degree or licenses required		
Length of time to complete training or earn degrees		
Average starting salary per year/average hourly wage		
Job outlook		
5 skills needed for this job		
Description of the job setting		
What are the primary job duties?		
Do you work alone or with people?		
What needs or wants does this occupation fill?		
What is one thing an employer would expect from someone in this position?		
What kinds of people are likely to be successful in this career?		

Sample questions for a guest speaker:

- Describe some of the kinds of decisions you have to make on a day-to-day basis.
- What are some misconceptions about your work?
- What makes your job exciting?
- What makes your job challenging?
- What are the biggest opportunities in this field right now?
- What advice do you have for someone who wants to get into this field?

Sample student reflection questions:

- How has your understanding about this career changed?
- What did you realize about yourself as you learned about this career?
- What have you learned about your community as it relates to opportunities in this career area?
- In what ways did learning about this field give you a new perspective, challenge your point of view, or introduce you to new ideas, skills, or information?
- What has this experience taught you about your criteria for an ideal job or career that you hadn't realized previously?
- How do you think what you learned will be useful for you in a professional setting (whether related to this particular career or another career)? Why do you think it will be useful in these ways?